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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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07/02/2001

Richard J. Markle

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23720

7590

07/12/2006

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EXAMINER

STOCK JR, GORDON J

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 07/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/897,573

Applicant(s)

MARKLE ET AL.

Examiner

Gordon J. Stock

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4, 13, 21 and 37 is/are allowed.
- 6) ☒ Claim(s) 1, 2, 5-11, 14-19, 22-36 and 38-47 is/are rejected.
- 7) ☒ Claim(s) 3, 12 and 20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

1. The Amendment received on April 14, 2006 has been entered into the record.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 1, 5-10, 19, and 22-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Marinaro et al. (6,051,348)**—**cited by applicant** further in view of **Kiba (3,620,795)**.

As for **claims 1, 5-10, 19, 22-26**, Marinaro in a method for detecting adjustment error in photolithographic stepping printer discloses the following: providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid (**claims 1, 6, 19, 23**)(Fig. 5: 34); illuminating at least a portion of the grid with a light source and measuring light reflected from the illuminated portion of the grid with an opto-electronic scanner (**claims 1, 6, 19, 23**) (col. 5, lines 30-35) to generate a reflection profile, a digital image, that will be compared with a library of predetermined patterns, target profiles (**claims 1, 6, 8, 19, 23**)(col. 5, lines 35-40); wherein, at least one parameter of an operating recipe of a photolithography tool is determined in order to be corrected for subsequent wafers and reworking (**claims 5 and 23**)(col. 2, lines 7-27; col. 4, lines 35-65); and an intensity profile of the digital image is used from a color gradient profile (**claims 7, 16, and 24**) (col. 4, lines 55-60); wherein, a fault condition is identified (**claims 9 and 25**)(col. 4, lines 40-65). Marinaro does not explicitly state that the grid pattern has openings; however, he teaches positive photoresist process (col. 1, lines 25-30). Therefore, it

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would be obvious to one of ordinary skill in the art at the time the invention was made that the grid pattern had openings for the regions between the intersecting lines would dissolve away during development to create openings when created via a positive photoresist process.

Marinaro does not explicitly state that a dimension of the grid is determined based on the reflection profile compared to the target profile nor does he explicitly state the type of dimension determined. He does suggest that dimensions are determined for abnormalities such as unevenness or abnormalities of images are determined as adjustment error of the photolithography system through comparison of grid images with predetermined patterns (col. 5, lines 35-40) and mentions the use of color gradients in error analysis (col. 4, lines 30-40). Kiba in a mask system teaches that color gradients in patterns are directly related to line width error (col. 1, lines 10-25). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that a grid dimension such as width was determined via pattern analysis through pattern comparison of target profiles in order to determine the amount of unevenness in the grid image to evaluate the adjustment error of the stepper.

4. **Claims 2, 11, and 14-18**, are rejected under 35 U.S.C. 103(a) as being unpatentable over **Marinaro et al. (6,051,348)**—**cited by applicant** further in view of **Kiba (3,620,795)**.

As for **claims 2, 11, 14-18**, Marinaro in a method for detecting adjustment error in photolithographic stepping printer discloses the following: providing a wafer having a test structure comprising a plurality of intersecting lines that define a grid pattern (**claims 2, 11, 15**)(Fig. 5: 34); illuminating at least a portion of the grid with a light source and measuring light reflected from the illuminated portion of the grid with an opto-electronic scanner (**claims 2, 11, 15**) (col. 5, lines 30-33) to generate a reflection profile, a digital image, that will be compared

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with a library of predetermined patterns, reference reflection profiles (**claims 2, 11, 15**) (col. 5, lines 35-40); wherein, at least one parameter of an operating recipe of a photolithography tool is determined in order to be corrected for subsequent wafers and reworking (**claims 14-15**)(col. 2, lines 7-27; col. 4, lines 40-67); and an intensity profile of the digital image is used from a color gradient profile (**claim 16**) (col. 4, lines 55-60); wherein, a fault condition is identified (**claim 17**)(col. 4, lines 40-65).

Marinaro does not explicitly state that the grid pattern has openings; however, he teaches positive photoresist process (col. 1, lines 25-30). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the grid pattern had openings for the regions between the intersecting lines would dissolve away during development to create openings when created via a positive photoresist process.

Marinaro does not explicitly state that a dimension of the grid is determined based on the reflection profile compared to a closest selected reference profile having an associated grid dimension metric nor does he explicitly state the type of dimension determined. He does suggest that dimensions are determined for abnormalities such as unevenness or abnormalities of images are determined as adjustment error of the photolithography system through comparison of grid images with predetermined patterns (col. 5, lines 35-40) and mentions the use of color gradients in error analysis (col. 4, lines 30-40). Kiba in a mask system teaches that color gradients in patterns are directly related to line width error (col. 1, lines 10-25). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that a grid dimension such as width was determined via pattern analysis through pattern comparison of selected reference profiles with a dimension metric closest to the grid image being evaluated in

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order to accurately determine the amount of unevenness in the grid image to evaluate the adjustment error of the stepper.

5. **Claims 27, 28, 29, 30, 31, 40, 41, 45-47** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Marinaro et al. (6,051,348)**—**cited by applicant** further in view of **Kiba (3,620,795)**.

As for **claims 27, 28, 29, 30, 31, 40, 41, 45-47**, Marinaro in an apparatus for detecting adjustment error in photolithographic stepping printer discloses the following: means for receiving a wafer having a test structure comprising a plurality of intersecting lines that define a grid pattern (**claims 27, 40, 41, 45**), (Fig. 2: 32, 30; Fig. 5: 34); a light source adapted to illuminate at least a portion of the grid and a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile, an opto-electronic scanner (**claims 27, 40, 41, 45**) (col. 5, lines 33-35); a data processing unit, a programmed digital computer, a determining means (**claims 27, 40, 41, 45**)(col. 5, lines 33-35); wherein, the reflection profile is compared to a library of reference reflection profiles otherwise target profiles, predetermined patterns (**claims 28, 31, 40, 41, 46, 47**)(col. 5, lines 35-40); wherein a reflection profile is based on intensity through color gradients obtained (**claim 29**)(col. 4, lines 55-60); a reflectometer is used (**claim 30**)(col. 5, lines 30-33).

Marinaro does not explicitly state that the grid pattern has openings; however, he teaches positive photoresist process (col. 1, lines 25-30). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the grid pattern had openings for the regions between the intersecting lines would dissolve away during development to create openings when created via a positive photoresist process.

He does not explicitly state that the determining means, the computer, determines a dimension of the grid based on the reflection profile compared to the target profile nor does he explicitly state the type of dimension determined. He does suggest that dimensions are determined for abnormalities such as unevenness or abnormalities of images are determined as adjustment error of the photolithography system through comparison of grid images with predetermined patterns (col. 5, lines 35-40) and mentions the use of color gradients in error analysis (col. 4, lines 30-40). Kiba in a mask system teaches that color gradients in patterns are directly related to line width error (col. 1, lines 10-25). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that a grid dimension such as width was determined via pattern analysis through pattern comparison of target profiles in order to determine the amount of unevenness in the grid image to evaluate the adjustment error of the stepper.

In addition, he does not explicitly state that a dimension of the grid is determined based on the reflection profile compared to a closest selected reference profile having an associated grid dimension metric nor does he explicitly state the type of dimension determined and therefore, the particular means associated with the steps. He does suggest that dimensions are determined for abnormalities such as unevenness or abnormalities of images are determined as adjustment error of the photolithography system through comparison of grid images with predetermined patterns via pattern analysis and thereby suggests a comparison of closest predetermined patterns of a particular metric with the grid image being evaluated in order to determine the amount of image unevenness via processing means, the digital computer (col. 4, lines 50-55; col. 5, lines 20-40) and mentions the use of color gradients in error analysis (col. 4,

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lines 30-40). And Kiba in a mask system teaches that color gradients in patterns are directly related to line width error (col. 1, lines 10-25). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that a grid dimension such as width was determined via pattern analysis by processing means, a digital computer, through pattern comparison of selected reference profiles with a dimension metric closest to the grid image being evaluated in order to accurately determine the amount of unevenness in the grid image to evaluate the adjustment error of the stepper.

6. **Claims 32, 33, 34, 35, 36, 38, and 39** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Marinaro et al. (6,051,348)**—**cited by applicant** further in view of **Kiba (3,620,795)**.

As for **claims 32, 33, 34, 35, 36, 38, 39**, Marinaro in an apparatus for detecting adjustment error in photolithographic stepping printer discloses the following: a processing tool that is a photolithography tool (**claims 32 and 38**)(Fig. 2: 12); a metrology tool adapted to receive a wafer having a test structure comprising a plurality of intersecting lines that define a grid pattern (**claims 32 and 38**) (Fig. 5: 34) comprising a light source adapted to illuminate at least a portion of the grid and a detector adapted to measure light reflected from the illuminated portion of the grid to generate a reflection profile, an opto-electronic scanner (**claims 32 and 38**) (col. 5, line 34); a data processing unit, a programmed digital computer (**claims 32 and 38**) (col. 5, line 36); wherein, the reflection profile is compared to a library of reference reflection profiles otherwise target profiles, predetermined patterns (**claims 33 and 36**)(col. 5, lines 35-40); wherein a reflection profile is based on intensity through color gradients obtained (**claim 34**) (col. 4, lines 55-60); a reflectometer is used (**claim 35**)(col. 5, lines 30-35); wherein, lithographic

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parameters are determined (**claims 32 and 38**) (col. 2, lines 7-27; col. 4, lines 35-65); wherein, a fault condition is identified (**claim 39**)(col. 4, lines 40-65).

Marinaro does not explicitly state that the grid pattern has openings; however, he teaches positive photoresist process (col. 1, lines 25-30). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the grid pattern had openings for the regions between the intersecting lines would dissolve away during development to create openings when created via a positive photoresist process.

He does not explicitly state that the data processing unit, the digital computer, determines a dimension of the grid based on the reflection profile compared to the target profile nor does he explicitly state the type of dimension determined. He does suggest that dimensions are determined for abnormalities such as unevenness or abnormalities of images are determined as adjustment error of the photolithography system through comparison of grid images with predetermined patterns (col. 4, lines 50-55; col. 5, lines 20-40) and mentions the use of color gradients in error analysis (col. 4, lines 30-40). And Kiba in a mask system teaches that color gradients in patterns are directly related to line width error (col. 1, lines 10-25). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that a grid dimension such as width was determined via pattern analysis with the digital computer through pattern comparison of target profiles in order to determine the amount of unevenness in the grid image to evaluate the adjustment error of the stepper.

In addition, he does not explicitly state that a dimension of the grid is determined based on the reflection profile compared to a closest selected reference profile having an associated grid dimension metric nor does he explicitly state the type of dimension determined being

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performed by the digital computer. He does suggest that dimensions are determined for abnormalities such as unevenness or abnormalities of images are determined as adjustment error of the photolithography system through comparison of grid images with predetermined patterns via pattern analysis and thereby suggests a comparison of closest predetermined patterns of a particular metric with the grid image being evaluated in order to determine the amount of image unevenness via processing means, the digital computer (col. 4, lines 50-55; col. 5, lines 20-40) and mentions the use of color gradients in error analysis (col. 4, lines 30-40). And Kiba in a mask system teaches that color gradients in patterns are directly related to line width error (col. 1, lines 10-25). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that a grid dimension such as width was determined via pattern analysis by processing means, a digital computer, through pattern comparison of selected reference profiles with a dimension metric closest to the grid image being evaluated in order to accurately determine the amount of unevenness in the grid image to evaluate the adjustment error of the stepper.

As for an actual controller, Marinaro does not specifically state this, but he mentions the determination of adjustment errors of a photolithographic system (col. 4, lines 40-67; col. 5, lines 30-40) and discloses adjusting photolithographic parameters such as focus and tilt to adequately process wafers (col. 2, lines 15-35). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have a controller in order to determine photolithographic parameters in order to adjust these parameters to have adequate processing of subsequent wafers and to rework incorrectly processed wafers.

7. **Claims 42-44** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Marinaro et al. (6,051,348)**—cited by applicant.

As for claims **42-44**, Marinaro in a method for detecting adjustment error in photolithographic stepping printer discloses the following: a test structure comprising a first plurality of lines and a second plurality of lines intersecting the first plurality of lines, the first and second pluralities of lines defining a grid (**claim 42**)(Fig. 5: 34); further comprising a processing layer, a photoresist layer, the grid being defined in the process layer (**claims 43-44**)(col. 3, lines 15-20 and lines 34-37; col. 4, lines 13-15). Marinaro does not explicitly state that the grid pattern has openings; however, he teaches positive photoresist process (col. 1, lines 25-30). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the grid pattern had openings for the regions between the intersecting lines would dissolve away during development to create openings when created via a positive photoresist process.

Allowable Subject Matter

8. **Claims 3, 12, 20** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 4, 13, 21, and 37 are allowed.

As to **claim 3**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining grid dimensions the particular determining at least one parameter of an operating recipe of an etch tool step, in combination with the rest of the limitations of **claim 3**.

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As to **claim 4**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining grid dimensions the particular determining at least one parameter of an operating recipe of an etch tool, in combination with the rest of the limitations of **claim 4**.

As to **claim 12**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining grid dimensions the particular determining at least one parameter of an operating recipe of an etch tool step, in combination with the rest of the limitations of **claim 12**.

As to **claim 13**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining grid dimensions the particular determining at least one parameter of an operating recipe of an etch tool, in combination with the rest of the limitations of **claim 13**.

As to **claim 20**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining grid dimensions the particular determining at least one parameter of an operating recipe of an etch tool step, in combination with the rest of the limitations of **claim 20**.

As to **claim 21**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining grid dimensions the particular determining at least one parameter of an operating recipe of an etch tool, in combination with the rest of the limitations of **claim 21**.

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As to **claim 37**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a processing line the particular controller, in combination with the rest of the limitations of **claim 37**.

Response to Arguments

9. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. Examiner would like to apologize for the inconvenience but upon further consideration of **Marinaro et al. (6,051,348)**-cited by applicant and upon further search a new ground(s) of rejection has been made. **Marinaro et al. (6,051,348)** has been considered over **Marinaro et al. (6,245,584)** because of it qualifying as a reference under 35 U.S.C. 102(b) with 35 U.S.C. 103(a); wherein, **Marinaro et al. (6,245,584)** qualifies as a reference under 35 U.S.C. 102(a) or at best 35 U.S.C. 102(e) in view of the declarations filed March 11, 2005 and April 11, 2005.

Fax/Telephone Numbers

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

- 1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and
- 2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: (571) 273-8300

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431.

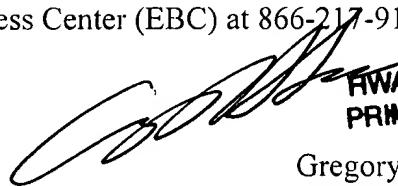
The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached at 571-272-2800 ext 77.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private Pair system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



gs
July 8, 2006



HWA (ANDREW) LEE
PRIMARY EXAMINER

for :
Gregory J. Toatley, Jr.
Supervisory Patent Examiner
Art Unit 2877